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THE ADOPTION OF THE METRIC SYSTEM IN THE UNITED STATES¹

THE METRIC SYSTEM FROM THE STANDPOINT OF ELECTRICAL ENGINEERING

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IT is now generally admitted by the great majority of intelligent persons in America, that the metric system is a much simpler and better system than the customary Anglo-American system of weights and measures. Including all the units appearing in our regular American school lists of length, area, volume, dry measure, apothecaries' measure, liquid measure, cord measure, avoirdupois and troy weight, there are in vogue about forty units with numerous and miscellaneous numerical cross ratios; whereas the metric system employs only two—the meter and the gram, with derivatives, provided it be admitted that a decimal derivative is merely the same unit with a shift of the decimal place. Thus in the case of a sum of money expressed both in dollars and in cents, the cent may be considered to be included within the dollar unit. A considerable amount of our school arithmetic is occupied in learning tedious conversions from one measure to another, or from one unit to another unit of the same measure, all of which is saved and eliminated from the arithmetic of foreign countries.

Moreover, apart from the question of relative simplicity of the metric and Anglo-American systems, the fact is self-evident that the metric system is an international system, in the sense that all the accurate scientific work of the world is done in that system, in America or elsewhere, and also that it is the system used in every-day life by the civilized peoples all over the world, except in America, Great Britain, and her colonies. It is surely inevitable that when two systems of units, one clumsy, complex and crude, the other simple and scientific, are

¹ A conference held under the auspices of the Section of Social and Economic Science of the American Association for the Advancement of Science, New York, December 26, 1916.

operating side by side, the world is too small to permit of both being continued indefinitely. Sooner or later the complex system of one set of peoples must give way to the simple system of many sets of peoples, each of which has already thrown over its original system in favor of that simple system.

It appears, therefore, that the real question to be considered at this time, is not whether the Anglo-American system shall or shall not be indefinitely retained. That question was settled long ago, when all the other countries of the world came, one by one, to adopt the metric system. The real question is how, and how soon, the English-speaking peoples should change to the international metric system. Deferring the change does not make it any easier. The longer we put it off, the longer we cut ourselves off from full quantitative concourse with the rest of the civilized world, and the harder we make the exchange of ideas and the exchange of commodities. Already the English-speaking peoples are intellectually beleaguered by all the other peoples, who regard us in this matter as on a lower level of development. Our books and writings, in all quantitative statements of the customary system, are either neglected or ignored, on account of the difficulty of understanding them. Moreover, they are ambiguous even to ourselves; because the respective wet and dry American pint, quart and gallon differ from each other and from the corresponding British quantities, by a very considerable percentage, not to speak of the different kinds of pounds and tons; so that when we see any of these units in general literature, we often do not know which is meant.

The principal objection raised against the general introduction of the metric system is the expense which the change would involve. Some go so far as to assert that the change would necessitate the rejection and destruction of a large amount of machinery and machine tools throughout the country. There seems to be no warrant for the latter belief. In France, Germany, Italy and other countries which have adopted the metric system, the history of the change indicates that the only machines destroyed or put out of commission by the change were those which made the old measures. A machine for turning out foot-rules or pound weights would clearly call for considerable modification or even for rejection. Such special machines would, however, be relatively very few, and the new business involved in making the new measures would be likely to compensate for this loss. No ordinary machines, such as lathes, drills, shapers, etc., would have to be changed if the metric system were adopted: because no one would be likely to insist upon having things changed to exact even sizes in the new measurements. The same old tools would go on making the same old things; but the numerical values of the sizes made would be altered. At the present time, the sizes of parts are seldom exact unit sizes. They have

ordinarily to be expressed in units and decimals, especially when precision is required; so that, under the new system, there would be merely a recataloguing under new units and decimals. There would certainly be expense connected with the change; but it would be more of an intellectual character than of a material character. It would be essentially the expense of learning the new system, and of becoming familiar with it. It would be the expense of recataloguing, reestimating, altering the sizes of parcels and of purchases, together with the expense of the mistakes that would naturally occur during the transition period. An appreciable source of expense would lie in the translation of sizes and other recorded quantities in books, blueprints and general literature. All changes for the better involve some inconvenience and expense. The national and international advantages would, it is generally conceded, go far beyond defraying the necessary inconvenience and expense of changing the numerical scales and measures of the things which we use. It is not likely that this would involve any appreciable change in the things themselves.

The individuals most inconvenienced by the change would probably be the intellectually aged, who could not change their fixed habits of thought even into simpler channels, and those engaged in businesses involving numerous records, such as surveyors or manufacturers with large numbers of lists and drawings of sizes and parts. On the other hand, many classes of the community, such as merchants, professional men, farmers and manual workers, would have but little difficulty in their part of the transition.

The American Institute of Electrical Engineers took a canvass in 1902 of their membership, on the question of the adoption of the metric system by congress. A large majority were in favor of the change. Electrical units, which are international and in world-wide use, are already metric. That is to say the volt, ohm, ampere, etc., used in all electrical engineering are derived from and based on the metric system. The use of such units in connection with the Anglo-American units is made unnecessarily awkward, and a change to the metric system would simplify the use of electric units. All the monthly bills for electric lighting and power rendered from electric meter registrations in the United States are already metric. Every nickel or five-cent piece fresh from the mint, weighs just five grams by law. In these and a few other matters of daily life, we have already changed to the metric system in the United States.

In view of the inconvenience of a change in America to the metric system, no sudden transition should be invoked by congressional action. Ample time for preparation should be allowed in any legislation directed towards the change. In this way, lists, catalogues, and sizes could all be tabulated in advance in both systems, side by side, so that gradually

the old numerical values could be dropped. The easiest and least expensive way of introducing the system would probably be to have certain United States government departments adopt the system exclusively after a certain date. Only those persons or firms dealing directly with those departments would then be compelled to change their listings and prices. Gradually, the process would be likely to extend into general literature, business and manufacture, without the exercise of compulsion.

THE METRIC SYSTEM FROM THE PAN-AMERICAN STANDPOINT

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THE Pan-American Union was created by a resolution adopted in the First International Conference of the American republics held in Washington in 1889. All the twenty-one independent republics of North and South America join together in the support and maintenance of the institution which is governed by a board consisting of the secretary of state, *ex officio*, and the diplomatic representatives in Washington of the twenty Latin American republics. Its general purpose is to create and foster a larger commercial and intellectual intercourse between the republics of the American continent. It is an all American institution interested in every question which does or might concern the two Americas, among which the question of weights and measures is not the least important.

If there is one thing in the future that can be predicted as a truth with more certainty than another it is the changing position of the United States in respect to its foreign commerce. This change, while it will be accelerated by the war, is in no way a result thereof. It is due entirely to our own development, consequently creating a changed international commercial status for the United States. It is industrial evolution in its comparative relations.

Formerly our exports were of raw materials, primary food products, slightly wrought commodities, in fact, of those things wherein the larger commercial values were represented by the work of nature and the lesser values by the work of man. We were selling primarily the minerals from our hills, the trees from our forests, and in our cotton and our grain the fertilizing elements of our soils. We were selling for the most part the handiwork of nature and not of man. We were depleting our capital resources—but on the whole not at a loss. We were following the natural highway of evolution from the forest and mining industries